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VIEWS, NEWS AND INTERVIEWS.

The copper production of the world for 1894 was 330,500 tons.

An electric plough has been brought out in Germany by Messrs. F. Zimmerman & Company, of Halle. A chain is stretched round the field where required, and runs over a sprocket wheel on the motor. The latter is thus able to wind itself along and drag the plough after it. The cable to the motor is carried on a number of small trolleys running over the ground. The length of cable is sufficient to reach across the field, as the motor, as it winds itself backwards and forwards, swings the cable over the ground. By starting work on the side nearest the engine and working up the field away from it, the cable does not foul the plough. The trials of the plant are said to have been most satisfactory.

To the Pyramids by trolley may soon be a possible trip. The Egyptian Government has just granted a concession for an electric railroad in Cairo, and the Pyramids are only eight miles away.

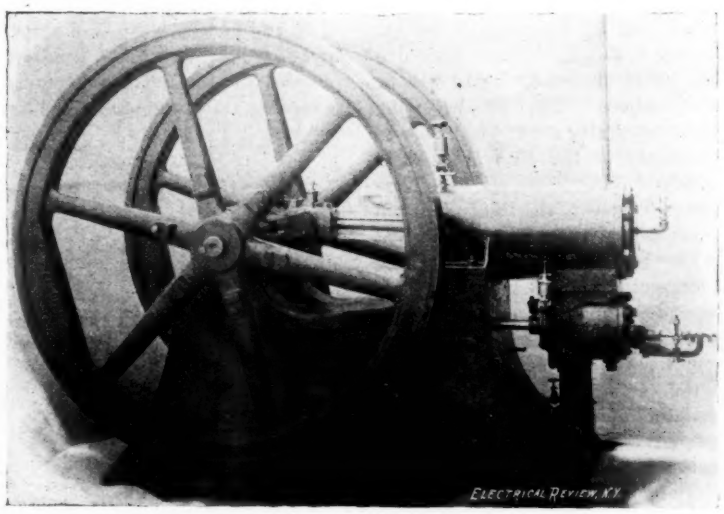
A London journal says that since the introduction of the electric light public performers are able to preserve their voices in better condition, and are 50 per cent more often in good voice. They are cooler, do not perspire and are not husky while singing or acting. The atmosphere is better and the equal temperature of the whole building has greatly diminished the risk of taking cold. Their throats are not parched and their voices not injured so much as in houses where gaslight is used.

During the Brooklyn trolley strike militiamen quartered in one of the car barns did part of their cooking by electricity.

The following letter appeared in a recent issue of the New York *Sun:* I noticed in your Sunday edition, January 20, an article headed "Extracting Teeth by Electricity," taken from the London *Nature*. I wish to say in reference to the article, that in 1858 or 1859, Dr. B. F. Smith, dentist, of New Orleans, corner of Canal and Baronne streets extracted a tooth for me by the aid of a galvanic battery, which amounts to the same thing, I think. The battery was a small box two and one-half feet by eight inches by eight inches. One wire was attached to the forceps, the other held in the hand. As well as I can remember, the shock was as bad as the aching tooth. The doctor was of an ingenious turn of mind and thought that there was millions in everything he invented, which were many.

The revenue of the Western Union Telegraph Company for furnishing the time of day to this country amounted last year to about $1,500,000. The company has a telegraph desk in the Naval Observatory in Washington. Four minutes before noon the wires of the system all over the United States are cleared of business, and the instant the sun passes the 75th meridian electricity carries the news to every city.

In the Loo-Choo Islands, between Japan and Formosa, though there are neither vehicles nor public lighting, the inhabitants have letter boxes and telephones.



THE QUAST GAS AND GASOLINE ENGINE.

Standard Underground Cable Company Elects Officers.

On January 26, 1895, the board of directors of the Standard Underground Cable Company held their first regular meeting after the annual stockholders' meeting of January 22, and elected the following executive officers of the company for the ensuing year: George Westinghouse, Jr., president; Joseph W. Marsh, vice-president and general manager; Frank A. Rinehart, secretary and treasurer; Charles M. Hagen, auditor.

At the annual meeting of the stockholders, Joseph W. Marsh was also re-elected as one of the directors in the company. Mr. Marsh is now entering upon the fourteenth year of his connection with this successful corporation, during most of which time he has been its general manager.

Texas Street Railway Association.

The second annual meeting of the Texas Street Railway Association was held at Dallas, Tex., on January 23, at the Oriental Hotel, President W. H. Sinclair, of Galveston, presiding. Under the heading: "What does the public want and how can we best supply it?" a general discussion of headway, time-tables, roadbed, general repairs, etc., was gone into.

THE QUAST GAS AND GASOLINE ENGINE.

BY CHARLES QUAST.

The gas engine is comparatively new, yet since the year 1863 the cost of working has been reduced to one-sixth. To-day large gas and gasoline engines are successfully operated, some as high as 325 horse-power, and soon internal combustion engines will be used in places where, at present, we think it impossible. Some of our present gas engines, of larger sizes, have reduced the gas consumption to 18 feet per indicated horse-power per hour, and the only drawback is the difficulty experienced by some in obtaining a uniformly even speed of rotation—a difficulty arising from the irregularity of explosions, which is caused by the governor, to effect the regulation of the speed of the engine. The irregularities caused by the irregular explosions are noticeable to the eye on the engine and also on the machinery driven thereby.

In view of the constantly increasing demand for gas and gasoline engines, the engine illustrated by the cut is brought before the public. In this engine all the above facts have been considered as far as practicable, and the result has brought forth an engine which excels others in the majority of its points.

In the accompanying illustration, representing the Quast gas and gasoline engine, an explosion takes place at every other revolution, but the force of the explosion is regulated by a governor, which controls the amount of fuel entering the cylinder.

The novelty in this engine is that there is but one valve, which accommodates both the suction and the exhaust. It is of the rotating type, being automatically oiled and operated in such a manner that cleaning, grinding and regrinding is not necessary.

The ignition of the compressed charge in the cylinder is effected by an electric spark, which, without question, is the best possible way. The Quast igniter consists of two small cells, which are especially constructed for this purpose. The spark

is so strong and effective that so far the speed of the engine has not been high enough to cause it to fail to ignite, although the engine, a 12 horse-power actual, was running 950 revolutions a minute, exploding every other revolution. There is absolutely no smell to the igniting device and the chemicals of the cells need not be replenished for two years, but the cells have to be connected to an electric circuit, either incandescent or arc, for about three hours every six months, which can easily be done. The life of the cells is about six years.

A small oil pump, worked and controlled by the governor, draws gasoline from the oil tank under ground to the engine and forces it into the air mixer, no vaporizer being used; this takes place only during the outstroke of the engine piston when it is drawing in a charge.

Owing to the valve and igniting arrangement the engine can be run with safety at a very high speed and has given great regularity.

This engine, built with two cylinders, would make the best and cheapest power for electric light plants. Various tests were made with this engine and have given a gasoline consumption of five-eights of a gallon per horse-power per 10 hours. One of these tests lasted three days.

Efficiency, economy, quiet and smooth running, general reliability, combined with simplicity and neatness of design are the chief points claimed for it. The engine is started without any delay, the speed and the point of ignition are regulated without stopping the engine.

For electric lighting, the Quast engine may well be placed among the first, as practical tests have proven its steadiness and high rate of speed. Electricians lay stress upon these qualifications in engines offered for the lighting field, and this engine has filled the want, because built with special reference to it.

The inventor had years of experience in the gas engine line and it is the aim to place on the market an engine which can be guaranteed, sold at a moderate price and filling all requirements. The engine is manufactured by the Quast Gas and Gasoline Engine Company, of Bucyrus, Ohio.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

POSTPONEMENT OF FEBRUARY MEETING.

On account of conflicting dates with the convention of the National Electric Light Association, to be held at Cleveland, February 19, 20 and 21, the regular monthly meetings for the Institute at New York and Chicago, have been postponed from February 20 to Wednesday, February 27, 1895.

The paper to be presented on the latter date is by Mr. H. Ward Leonard, entitled, "Notes on Recent Electrical Engineering Developments in France and England," being the results of the author's recent personal observations in electric light, railway, central station and underground practice. The usual notices will be mailed in advance of the meeting.

ELECTRIC LIGHTS FOR BROOKLYN BRIDGE CARS.

THE SYSTEM ABOUT COMPLETED.

In November last the trustees of the New York and Brooklyn Bridge awarded a contract for lighting the bridge cars by electricity to the Electrical and Mechanical Engineering and Trading Company, of New York city. It was decided to use the overhead trolley system for supplying current to the cars, and the work of installing the system has been in progress steadily from the time the contract was signed. It is now expected that by February 15 the old oil lamps will have been discarded and the incandescent lamps will be in operation. The accompanying illustrations give a very good idea of the details of the electric lighting system.

As will be seen, the side pole form of construction has been employed on the bridge approaches, and the other section of the trolley line is suspended directly from the bridge structure. The trolley leads running from the trolley pole to the interior of the car are carried on porcelain insulators along the edge of the roof and between the roof and the lining of the hood. The wiring in the interior of the cars is encased in hardwood mouldings that match the car trimming. Each circuit is furnished with a switch and cut-out. There are ten 16 candle-power lamps in each of the 60 coaches operated on the bridge. The lamps are located along the sides of the car near the ceiling, as shown in the illustration. By this means, people who are fortunate enough to secure seats during the rush hours of travel on the bridge, will be able to read. The oil lamps were hung from the center of the ceiling, and those standing in the car cut off the light from the passengers who were seated. With the electric lights on both sides of the car there will be light enough for all.

The incandescent lamps are placed in keyless sockets mounted on short brass goose necks and are arranged in two circuits, the lamps being wired alternately on each circuit. Each lamp is provided with a handsome fluted opal glass shade.

The leads on each car project through the hoods at the ends and terminate in flexible connectors, which may be joined so that a whole train can receive its current supply from one trolley. The rails are used for the return and are connected by the Vail rail bond. The track is cross-bonded every 500 feet. No part of the bridge structure is connected with the return circuit. Should the conductivity of the rails prove insufficient for the return, insulated track feeder cables will be installed.

The trolley wire is 00 hard drawn copper and lightning arresters, grounded to the bridge structure, are located along the line. The line insulators were supplied by the General Electric Company. The power plant consists of two automatic cut-off engines of 40 horse-power each, directly connected to a 25 kilowatt multipolar General Electric generator. The switchboard is made of marble mounted on an iron frame and equipped with Weston and General Electric instruments. The construction of the whole system is first-class throughout.

FIG. 1.—NEW YORK APPROACH TO BROOKLYN BRIDGE, SHOWING TROLLEY LINE CONSTRUCTION FOR CAR LIGHTING SYSTEM.

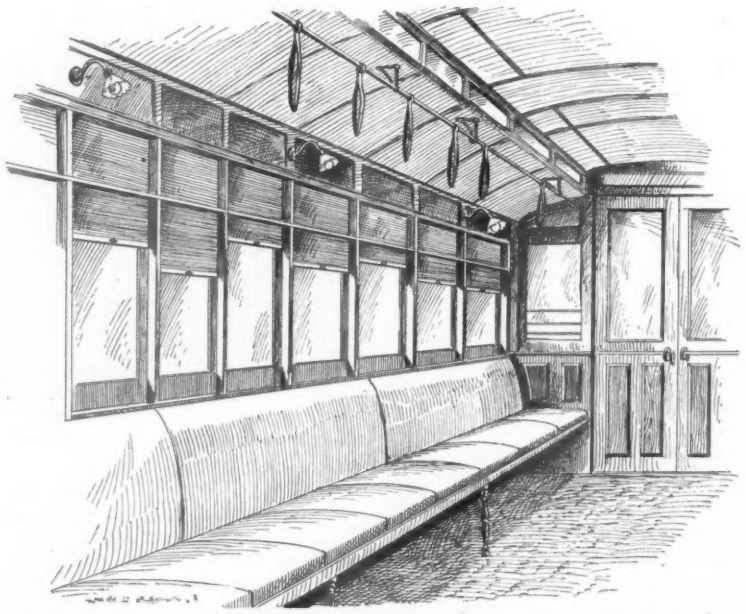


FIG. 2.—INTERIOR OF BRIDGE CARS, SHOWING LOCATION OF ELECTRIC LIGHTS.

PERSONAL.

Mr. C. E. Newton, of the Jewell Belting Company, Hartford, Conn., was among the visitors to New York last week.

Mr. James S. Humbird, president of the Washington Carbon Company, has been elected a director of the Baltimore and Ohio Railroad at Pittsburgh.

Robert Laidlaw, president of the Laidlaw-Dunn-Gordon Pump Company, of Cincinnati, was re-elected treasurer of the National Association of Manufacturers, which convened at Cincinnati the third week in January. Mr. Laidlaw was one of the leading spirits in the organization of the association, and much of the success of the convention was due to his superior executive skill and untiring energy. The delegation was banqueted at the new plant of the Laidlaw-Dunn-Gordon Pump Company.

The first regular scheduled train passed through the new Baltimore Belt line tunnel on February 1. The electric locomotives are expected to be in operation about April 1.

LITERARY.

We have received the seventy-sixth annual report of the New York State Library for the year ending September 30, 1893.

In the issue of *Once a Week* for January 24 appeared the first of a series of illustrated papers on "American Comic Journalism," by Mr. T. B. Connery, formerly editor of the New York *Herald*.

Never before has *Scribner's Magazine* had so many features running at the same time of the widest interest to everybody who is thoroughly awake to contemporary affairs and wants to be posted in regard to American topics. The February issue, just published, demonstrates this admirably.

The *North American Review* for February opens with three timely articles on the currency question, which are bracketed together under the title of "The Financial Muddle." They are written by Secretary of Agriculture J. Sterling Morton, Representative William M. Springer, Chairman of the House Committee on Banking and Currency, and Henry W. Cannon, president of the Chase National Bank of New York, and formerly Comptroller of the Currency.

There could be no fitter nor more interesting commemoration of the death of Robert Louis Stevenson than that made in *McClure's Magazine* for February. With pictures of Stevenson's South Sea life and home, and portraits of Stevenson extending from his babyhood to within a year of his death, and including a reproduction of the beautiful photograph by Sir Percy Shelley, is given, first, an account by a personal friend who saw him off from San Francisco, of his sailing to the South Sea and establishing himself in Samoa, and then tributes from his fellow Scotchmen, and in some sort disciples, J. M. Barrie, S. R. Crockett, and Ian Maclaren.

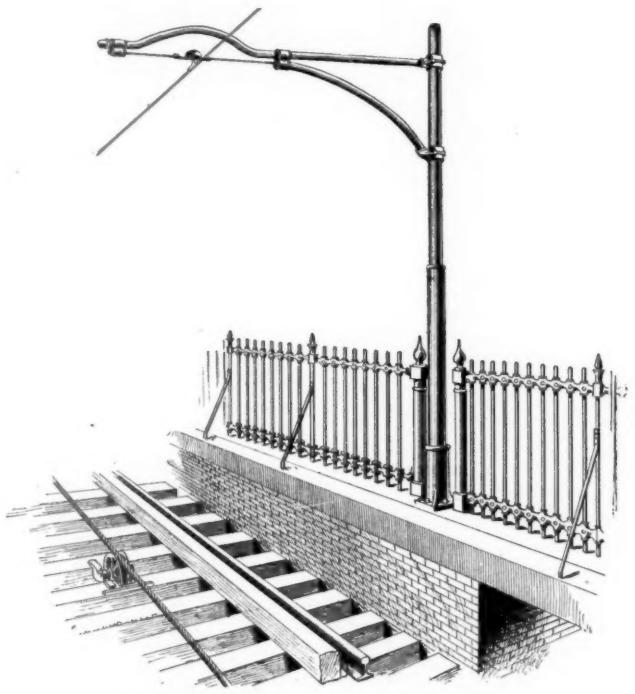


FIG. 3.—TUBULAR POLE USED ON BRIDGE APPROACHES.

"Electrical Engineering for Electric Light Artisans and Students," by W. Slingo and A. Brooker. Cloth, 753 pages, 346 illustrations. Price, $3.50. Sent, postage free, on receipt of price by ELECTRICAL REVIEW Publishing Company, 13 Park Row, New York.

Students and electrical engineers will learn with pleasure that a new, revised and up-to-date edition of this valuable text book has been published. The book first appeared in March, 1890, was reprinted in May, 1890, September, 1891, December, 1891, June, 1893, and appears in January, 1895 in a new and revised edition. The whole field of electric lighting is intelligently covered in this work and it is especially designed for men in charge of electrical machinery. By bringing the book up to the present practice of the art the authors have conferred a benefit upon electric light workers, whose appreciation will doubtless be indicated in the large demand for the book.

"Electrical Boats and Navigation," by Thomas Commerford Martin and Joseph Sachs. Cloth, 8vo., 232 pages, 143 illustrations. Price, $2.50. Sent postage free on receipt of price by ELECTRICAL REVIEW Publishing Company, 13 Park Row, New York.

The authors have chosen for their subject one of the applications of electricity that is still new and whose literature, up to the appearance of this book, had been confined to articles in the electrical papers and an occasional paper before a society. The first chapter is partially devoted to a historical resumé of electric boat building and operation. Among the many other phases of the subject, most of which are considered exhaustively, are descriptions of primary battery boats, storage battery craft of several kinds, torpedo boats, canal boat propulsion up to date, generating plant and distribution, comparisons of cost. Both the student and the inventor will find valuable data in this book, the first in its special field.

ELECTRIC LIGHT FLASHES.

Spencerville, Ohio, is to have an electric light plant.

At the annual meeting of the Webster, Mass., Electric Light Company N. T. Hurlbut was re-elected president.

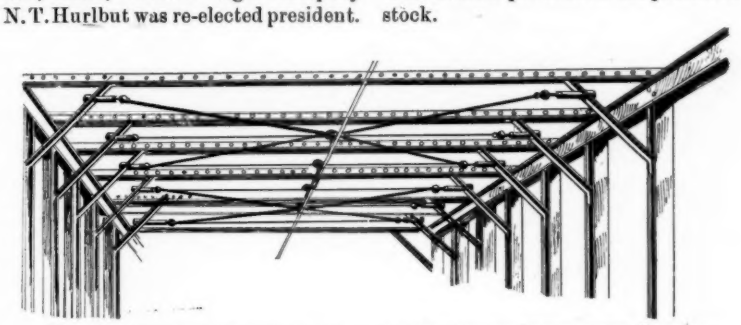


FIG. 4.—OVERHEAD CONSTRUCTION AT THE EXPANSION JOINT IN THE BRIDGE STRUCTURE.

At the annual meeting of the Pawtucket, R. I., Electric Lighting Company Captain William McGregor was chosen general manager.

A company is to be organized to build an electric light plant at Switz City, Ind., which will also supply Clinton, Worthington and other towns.

A Board of Trade committee has reported that it considers illegal the five-year contract between the city of Dayton, Ohio, and the Dayton Electric Light Company.

The Citizens' Electric Light Company's plant at Wellsville, Ohio, has been sold at receiver's sale. Homer Laughlin, of the Laughlin Pottery Company, East Liverpool, Ohio, bought in the plant for $9,050. It was appraised at $9,900.

The Power Development Company, of San Francisco, is putting in a 2,500 horse-power transmission plant at Bakersfield, Cal. Power is taken from the Kern River at a point, by the transmission line, 12 miles away. Mr. Fred. G. Cartwright, of San Francisco, is the consulting electrical engineer.

The Massachusetts Gas and Electric Light Commissioners have rendered a decision in the matter of the petition of the Natick Gas and Electric Light Company for approval of the issue by it of $125,000 stock and $125,000 bonds. The commissioners only approve the issue of $62,000 stock and $57,000 bonds.

The Cleveland, O., Electric Illuminating Company has re-elected the same directors and officers as last year. The officers are: President, Jas. Parmelee; vice-president and treasurer, Samuel Scovill; secretary, S. C. D. Johns; general superintendent, Robert Lindsay. The company recently declared a semi-annual dividend of three per cent on the preferred stock.

The stockholders of the Manchester, N. H., Electric Light Company have elected these directors for 1895: James A. Weston, Alonzo Elliott, Walter G. Africa, J. Brodie Smith, Joseph C. Moore, Harry E. Parker, John B. Varick, Frank Dowst, Joseph W. Hildreth. The directors have elected the following officers: President, Alonzo Elliott; vice-president, James A. Weston; treasurer, Walter G. Africa; clerk, J. W. Hildreth; superintendent, J. Brodie Smith.

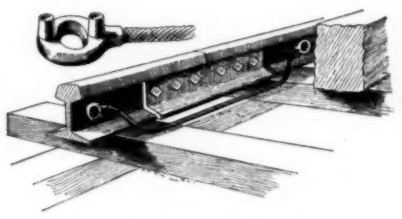


FIG. 5.—THE VAIL RAIL BOND.

The Bethlehem, Pa., Electric Light Company has elected these directors: James Thomas and Daniel Milson, of Catasauqua; J. S. Hess, of Hellertown, and F. W. Leinbach, T. M. Dodson, Alvin Hill and C. A. Wolle, of Bethlehem. The board re-elected James Thomas, president, and C. A. Wolle, secretary and treasurer. The company is in a healthy financial condition. The usual quarterly dividend of two per cent was declared. It was unanimously decided to increase the capital stock from $100,000 to $150,000.

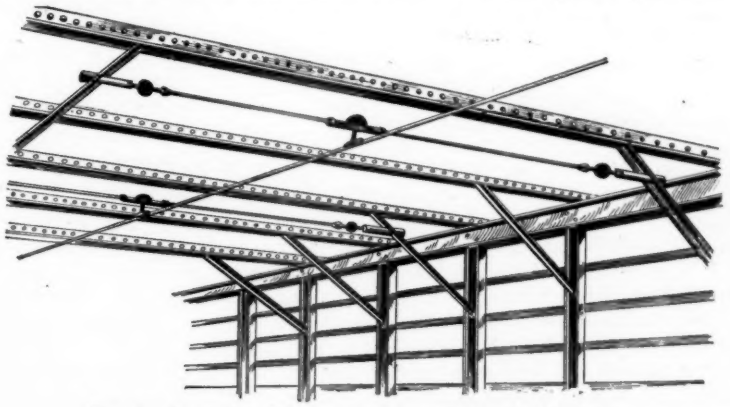


FIG. 6.—OVERHEAD CONSTRUCTION ON THE BRIDGE STRUCTURE.

The West Shore Telephone Company, providing it can get a sufficient number of subscribers, will connect High Falls, N. Y., with its service.

Treatment After Electrical Shock.

OPINION OF FRENCH MEDICAL MEN.

The French Academy of Medicine having been asked by the Ministry of Public Works to draw up a set of rules for the treatment of those who may receive electrical shocks, a committee was appointed consisting of Messrs. Bouchard, d'Arsonval, Laborde and Gariel. They have prepared the following statement, which is published in the London *Electrical Engineer:*

When a person is the victim of an accident due to contact with the electrical conductors or with the generators, the contact may exist when help arrives, or it may have ceased. In the former case, special precautions should be taken to break the contact without those helping becoming themselves victims. It is best to immediately stop the generating dynamo from working. If this be impossible, the current should be broken by cutting the conductor with instruments in which the cutting part is insulated from the handle, or the current is taken to earth or a branch by means of a conductor of low resistance, which will diminish the intensity of the current in the part where the victim is in contact with the principal conductor. These observations are merely made as a guide, and are to be formulated by a special technical commission instituted by the Ministry of Public Works.

The following measures are proposed: The victim is to be, first of all, taken into an airy place; three or four persons should be there to assist, and no one else allowed to enter. The clothing is to be loosened, and efforts to be made to re-establish respiration and circulation as soon as possible. To re-establish respiration, recourse can be had to the following two methods: viz., drawing of the tongue and artificial respiration. In the former case the mouth of the victim is opened, and if the teeth are clenched they are to be opened with the fingers, or, if there be resistance, with a piece of wood, the handle of a knife, spoon, or fork, or end of a walking stick. The front part of the tongue should then be taken between the thumb and index finger of the right hand, bare or covered with, say, a pocket handkerchief, to prevent slipping. The tongue is then strongly pulled and allowed to relax, in rhythmical imitation of respiration, at least 20 times a minute. These movements must be continued without a break for half an hour, an hour, or more. For artificial respiration, the subject should be laid on his back, the shoulders slightly raised, the mouth open and the tongue free. The arms are taken at the height of the elbows, supporting them strongly on the walls of the chest, next bringing them above the head, describing the arc of a circle. These movements are to be continued at least 20 times a minute until the re-establishment of natural respiration. It is suitable to commence with the movement of the tongue as described, simultaneously, if possible, adopting artificial respiration. At the same time it is desirable to try and restore circulation by rubbing the surface of the body, by beating the body with the hands or with wet towels, throwing cold water on the subject from time to time, and applying ammonia or vinegar to the nose.

Good Chances for First-Class Electrical Engineers.

[*From the New York Sun.*]

A young American who has entered an institution to study electrical engineering asks us to tell him whether he will be sure of finding employment as an electrical engineer when his studies are ended. We cannot see very far ahead, but we think he is likely to have a good chance of finding it. Electrical engineering is one of the rising industries of the country, and it is a very promising industry. There is reason to believe that it will yet become far more extensive than it has been at any time during the brief period of its existence. Every year we see electricity put to new uses, and the probability is that the measure of its utility will be increased indefinitely. Thus new opportunities will be opened up, from time to time, for those who are ready to take advantage of them, and more especially for those who are of an inventive turn of mind. First-rate electrical engineers are not overnumerous, and there is a constant demand for them. They are very well paid, too.

Our young inquirer will certainly have as good a chance of procuring employment at his chosen pursuit as he would have in any branch of professional activity; the law, for example, or in any of the ordinary industries. We believe his chances of success are greater than if he were to become a lawyer, a grocer, an author, or a knife grinder.

There always has been, and there always will be, a good chance of success in the world for any young man who is faithful, industrious, patient, earnest, and true. If, besides these invaluable qualifications of high manhood, he be so happy as to possess a mind open to the solicitations of life, he must be unlucky indeed if he fail to carry out any reasonable desire in the course of a lifetime.

"Able and Impartial."

TO THE EDITOR OF ELECTRICAL REVIEW:

Allow me to congratulate you on the general enterprise exhibited at all times by the ELECTRICAL REVIEW, and especially the able and impartial manner in which the telephone interests are covered.

Have always looked on the REVIEW as one of the leading journals in this field, and during my connection with it as an advertiser have had no reason to change my opinion in this respect.

Wishing you continued success, I remain,

Yours very truly,
(Signed) J. D. LEATHERBEE,
Treasurer.
National Telephone Manufacturing Company.
Boston, January 26, 1895.

Electricity and Rheumatism—The Use of the Current in Medicine.

TO THE EDITOR OF ELECTRICAL REVIEW:

An article of inquiry in your number of January 16, under the heading "Will Electricity Cure Rheumatism?" raises one of the livest issues in therapeutic electricity, and one upon which some very excellent work has been and is being done.

Dr. Monell, your correspondent, asks for information from central station people as to whether or not they have known of chronic rheumatism being cured while the afflicted is working about electricity, and whether employés of central stations are blessed with an immunity from this troublesome and obstinate malady. While we are waiting for any data upon this point that may be forthcoming, it would be interesting to discuss the status of the subject among electro-therapeutists and electro-physiologists.

Dr. d'Arsonval has reported some very interesting results of exhaustive researches. Without following his work, his deductions may be given. He found that electric currents, particularly those of the high frequency alternating variety, exercised a most stimulating influence on the movement of protoplasm; that they vastly increased the elimination of urea and carbonic acid gas, and correspondingly increased the consumption of oxygen. To the physiologist such an influence means a quickening of every vital function. Protoplasm may be considered the unit of life, if the term be applicable. Upon protoplasmic evolution depends life itself. The elimination of urea and carbonic acid gas from, and the consumption of oxygen in, the tissues are the essentials of health. Without going into a controversy upon the pathology of rheumatism and many of the nervous disorders, called neurasthenias, it may be said that diseases of these classes are due to faulty nutrition. Nourishment of the affected tissues has been and is eccentric or deficient. A general summing up may be made in the statement that high frequency alternating currents act as stimulants of nutrition, and rheumatism is primarily due to bad nutrition; *ergo*, electricity intelligently applied would seem to be indicated.

There is no doubt that very excellent results are being obtained at the hands of those who are competent to handle the current.

Incidentally a thought or two upon the general use of electricity in medicine and surgery may not be out of place here. In physics electricity has come to be one of the exact sciences. Less has been done in the therapeutic use of electricity than in any other direction. This is due to the necessity on the part of the investigator to know not only the physiological action of the current in all its varieties and under all conditions, but the pathology of the cases in which he purposes to use it. Our physicists are not physiologists or pathologists, and our physicians are not physicists. It goes without saying that these two branches of knowledge to be utilized must be combined in any intelligent investigator. This condition is being brought about by a number of medical men in the country now, who have gone to work upon the physics of electricity. A few foreigners have advanced considerably in this direction, because the best men are in the universities, and have access to the physical and electrical laboratories of their institutions, and they have profited by their opportunities.

Going back for a word upon the original subject of this note, I may venture to suggest that the data which Dr. Monell asked for will be valuable, not in discovering whether electricity may be tried in the treatment of rheumatism, but whether the theory advanced by a leader in this field of investigation can stand in the light of experience.

J. ALLAN HORNSBY, M. D.
New York, January 23, 1895.

Street Railway Association of New Jersey.

These officers have been elected by the recently organized Street Railway Association of New Jersey: President, David Young, of the Consolidated Traction Company; vice-president, G. George Browning, Camden Horse Railway Company; secretary and treasurer, Wm. B. Price, New Brunswick City Railway. The executive committee chosen consists of the foregoing officers and J. A. Morrissee, J. Willard Morgan and W. H. Starr.

The association already includes in its membership the Consolidated Traction Company, the Camden Horse Car Company, Camden, Gloucester and Woodbury Railway Company, Newark and South Orange Railway Company, New Brunswick City Railway Company, New Jersey Electric Railway Company, Paterson Railway Company, Trenton Passenger Railway Company, and the Jersey City, Hoboken and Rutherford Railway Company.

"Exceedingly Interesting."

TO THE EDITOR OF ELECTRICAL REVIEW:

I wish to add my testimony to that of many others on the great improvement in the ELECTRICAL REVIEW.

It is neat and attractive, well printed, well arranged, up to date and is always readable. I find it exceedingly interesting from week to week.

Although the oldest, glad to hear you feel young, vigorous and happy.

Very truly,
H. A. CLEVERLY.
Philadelphia, January 30, 1895.

Mayor Strong, of New York city, said recently: "We must have rapid transit, and to secure it we must spend money. I don't believe in giving up the plan if the cost is a few dollars more or less than was expected. I will give this matter a great deal of consideration soon. It is perhaps the most important matter we have to deal with. Real rapid transit is so much needed that it cannot be delayed much longer."

THE FREDUREAU LIGHT-DIFFUSING GLOBE.

ABSTRACT, BY V. M. BERTHOLD, OF A PAPER READ BEFORE THE FRENCH ACADEMY.

M. Fredureau, a well-known French electrician and specialist in electric lighting, has recently developed a new "light-diffusing globe." As the principle embodied therein is new and thoroughly scientific, giving highly satisfactory results for commercial lighting, the invention was thought of sufficient importance to form the subject of a paper read before the French academy by M. Potier, a member of the Institute.

The "diffuseur" consists of a number of layers of transparent glass, provided upon their surfaces with prismatic parallel rings, perpendicular to the axis of the globe. Their general exterior shape resembles the well-known catadioptrical rings used for lighthouse shades, but the diffusion of light which they produce is entirely different. The appearance of these rings also resembles spirals around a vertical axis. This construction effects:

1. The concentration of light towards the space below the focus, by causing the rays from the interior focus to be reflected or to be thrown upon the upper transparent portion of the rings.

2. The diffusion of the light by reflection and refraction due to the reciprocal action of the rings.

The prismatic rings are constructed in accordance with two systems.

1. Upper faces are paraboloids, so shaped that their focus coincides with the center of the globe. The lower plain surfaces perpendicular to to the axis receive rays reflected by the upper faces, allowing them to pass without dispersion.

2. Upper conical faces making an angle with the beams emanating from the focus, at least equal to the angle limit of the lens. The lower faces cut, corresponding to the conical surfaces, have the light focus for their apex. Theoretically, they ought to be cut in the shape of a torus, but the conical cut, which is easily manufactured, suffices for all practical purposes.

The following results are achieved by the above described arrangement of prismatic parallel rings:

1. To the eye of the observer the luminous point appears outside the lamp and within a large cluster of light which does not blind the eye, its length being equal to that of the globe. To make plain the action of the diffuser, the reader may recall the old experiment in which, by means of a lens, sunlight is thrown upon a sheet of paper. A brilliant light point is produced with a light emission sufficiently strong to blind the eye. In this experiment we have merely gathered a number of single rays, which fell upon the outer surface of the lens, into a single point or focus. The exactly opposite effect is produced in the diffuser. Here a light point of concentrated rays is dissolved, or changed into an outward area of intense light, consequently a light which does not injure the eye.

2. Moreover as the rays in the lower portion of the globe are also reflected without dispersion, there does not exist the usual cone of shadow, nor does the light produce any abrupt areas of light and shadow.

To prove the advantages inherent in these globes it is only necessary to devise an arrangement by which the ordinary globe of an arc lamp may be exchanged quickly with the diffuser. It needs neither an electrical expert nor a college professor to note the

TWO FORMS OF THE FREDUREAU LIGHT-DIFFUSING GLOBE.

vast difference both in the quality and quantity of the light.

In manufacturing these globes cut surfaces may be dispensed with; a less expensive way is to mould the prismatic rings under pressure. This plan has been adopted and, while it is true that, at present, such globes are a little higher in price than the ordinary lamp shades, the effect produced by the diffusers is such a decided improvement over our present apparatus that the average consumer or customer will gladly pay the difference in cost.

Besides, the new globe changes the "tonality" of the light, *i. e.*, the light no longer fatigues the eye, even if used in rather low studded and narrow rooms. The illustrations show two forms of the diffuser. It is found that, whatever the luminous source may be, the advantageous effect of the globe remains the same.

A telephone line is wanted between Centre Village and Galena, Ohio.

ELECTRIC RAILWAY NOTES.

Officers of electric railway companies are requested to send promptly to the ELECTRICAL REVIEW *notices of meetings, election of officers, declarations of dividends, financial reports and all items of interest in connection with the financial and practical operation of their roads.*

Louisville, Ky., wants better rapid transit facilities.

The Philadelphia Traction Company will equip all its cars with safety fenders.

State Engineer Adams, in his annual report, recommends the use of electricity for propelling canal boats on the canals of New York State.

M. F. Coolbaugh and E. N. Peters have been appointed receivers for the Delaware Valley Electric Railway, which is being built by Philadelphians from Stroudsburg to Bushkill, Pa.

It costs the West End Street Railway Company, of Boston, between $200,000 and $250,000 a year to keep its tracks clear of snow. A heavy snow storm costs the road about $50,000.

The York County Electric Railroad Company have applied for a charter at Augusta, Maine, for the purpose of operating an electric road through 13 towns in the State, from Kennebunkport to Biddeford. The capital stock was placed at $1,000,000.

The White-Crosby Company, of Baltimore, on a request from the Atlantic Avenue Railroad Company, of Brooklyn, N. Y., sent 20 men within 24 hours to repair the company's lines which had been cut by strikers. This gang of men kept the lines in repair thereafter and enabled the road to run its cars.

The Cincinnati, Hamilton, Middletown and Dayton Traction Company, of which Gen. A. Hickenlooper is president, and Mr. H. B. Morehead general manager, have opened general offices on the third floor of the *Commercial Gazette* building in Cincinnati. The headquarters are being fitted up handsomely, and already the scenes of activity are growing daily. The contract for the construction of the line will shortly be let, with a view to the completion of the road in time to operate it next Summer. It is believed that the line will be open to Hamilton by the early part of the Spring.

Manhattan Elevated Railway directors are busily at work digesting the figures and estimates of electrical experts as to the cost of an electrical equipment for the entire "L" system of New York city. It is the belief among the employés and managers of the "L" that before another year has passed the electric motors will be in operation. Russell Sage is strongly in favor of them, and the finishing touches are being given to an electric locomotive that, it is believed, will prove satisfactory. Mr. Sage says he expects to see electricity adopted by the "L" road before long, and admits that sample motors are now being made.

Area Lighted By a Sixteen Candle-Power Lamp.

TO THE EDITOR OF ELECTRICAL REVIEW:

I enclose herewith a clipping from your valued paper asking some of your friends to furnish Mr. L. E. Lannan, of Lehigh University, information in regard to the area which can be properly lighted with a 16 candle-power incandescent light.

Some time ago I made a number of experiments with a view to forming some definite idea on this subject, the result of which I tabulated and put in form and incorporated in a catalogue which I afterward issued. I herewith send you copy of the same, and I believe it will answer the question.

With kindest regards, I am,

Very truly yours,

FORÉE BAIN.

Chicago, January 24, 1895.

DISTRIBUTION OF LIGHTS.

A general idea of the distribution and number of incandescent lights needed for indoor use may be obtained from the following table:

In rooms with walls of medium dark or fairly light color, and not having too many obstructions, such as posts, machinery, belts, etc., the following table applies. Obstructions, dark colored walls and surroundings, dust, smoke and vapors, all very greatly modify the value of any light, and must be taken into consideration when making an estimate. For ordinary illumination, the number of lamps should be as follows:

Dimension of Rooms in Feet.			Number of Lamps each 8 to 10 Candle-powers.	Height of Lamps above Floor.	
Length.	Width.	Height.		Feet	Inches.
15	15	12	2 to 3	6	9
18	18	15.1	5 " 6	7	0
24.6	24.6	17	9 " 12	8	1
33	33	22.5	16 " 20	2	3
40	40	30	25 " 30	11	4
65	65	45	40 " 50	13	2
72	72	50	100 " 120	18	6

With 16 candle-power lamps 75 per cent, and with 20 candle-power lamps 65 per cent of the above numbers will give equal illumination. Smaller lights give better distribution.

The requirements vary in most every case, the surroundings affect the power of light very much more than is generally supposed; it is, therefore, a difficult task to formulate a rule that will apply in all cases.

For street illumination, in streets clear of trees, an arc lamp of 2,000 candle-power (or 450 watts) will effectively light an area having a radius of 400 feet, when placed between 30 and 35 feet above the ground. Suspended over the crossings of two streets, it will light better than gas one block in each direction, and thus each arc lamp will replace 10 gas lights. An incandescent lamp of 10 candle-power will light the streets as well as ordinary gas burners usually used for that purpose.

TO THE EDITOR OF ELECTRICAL REVIEW:

Mr. L. E. Lannan, of Lehigh University, will find the space lighted by a 16 candle-power incandescent lamp very well explained on page 265 of Guy's "Electric Light and Power," also in chapter 18 of Noll's "How to Wire Buildings."

They agree pretty well on a standard of 100 square feet of floor space ordinarily illuminated by a 16 candle-power lamp when suspended from eight to ten feet above the floor.

Yours respectfully,

D. L. DAVIS.

Salem, O., January 25, 1895.

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The ELECTRICAL REVIEW has never received at any one period as many kind words of commendation as have come to it spontaneously during the first month of 1895.

During all the wire cutting indulged in by the Brooklyn trolley strikers not a single man was shocked. What a pity it is that such men cannot work as carefully when being paid for it as when they are on strike!

DOES A TELEPHONE COMPANY CONTROL ITS OWN INSTRUMENTS?

An interesting question for telephone companies is to be decided in New York this week. Simon Sterne, attorney, secured an injunction last Saturday restraining the Metropolitan Telephone Company from increasing the rental for the telephone in his office or from removing it. His application to have the injunction continued is to be argued in the Supreme Court Chambers to-day.

This action is the result of the desire of the company to change all the grounded lines to metallic circuits, thereby giving an improved service. There is a natural increase of expense in this new service, but the change is so satisfactory that subscribers have heretofore most willingly paid the advanced cost. Mr. Sterne evidently prefers the antiquated grounded lines and the cheaper instruments. It is fortunate for the great progress made in telephone circles during the past few years that so few men of like mind as Mr. Sterne have appeared.

The chief argument as announced in favor of the injunction is that telephone rates are cheaper abroad. So is about everything else, probably including lawyers' fees, although we are not informed in this respect, but no doubt Lawyer Sterne is.

The decision by so high a tribunal as the Supreme Court of the State will be awaited with interest and, as we view it, will be of considerable importance as indicating the rights of telephone companies in controlling their own instruments and in regulating the service they must provide.

The newspaper-reading propensities of metropolitan residents is emphasized by the fact that the Brooklyn bridge cars have been provided with electric lights, the system being described on another page in this issue. Although the trip on the bridge cars occupies but six minutes, yet the bridge trustees were obliged to install electric lights at the request of the public, who could not permit their reading to be interrupted for even six minutes.

The Brooklyn trolley strike is over. On January 31 cars ran on all the lines on schedule time for the first time in 17 days. The losses occasioned by the violence of the strikers will amount to millions of dollars. Several lives were sacrificed. The old employés are making desperate efforts to get their places again. Violence and disregard of the laws, which apply to capital and labor alike, will not win a strike.

EFFECTS OF RAPID TRANSIT ON BOSTON SUBURBS.

The value of rapid transit in the development of suburban property is already pretty generally acknowledged, and since the adoption of electricity as a motive power, the possibilities in this respect have been thoroughly demonstrated. Nowhere, perhaps, has this phenomenal, but at the same time healthy, development been more marked than in Brookline, one of Boston's most beautiful and aristocratic suburbs.

Before the construction of the West End line on the Beacon street Boulevard property abutting thereon could be bought at prices ranging from 40 to 60 cents a square foot. This same property brings to-day from $2.75 to $4, while some of the choicest locations are held by the owners at prices which denote their intention to await a still further advance in value. Locations along the Boulevard and Commonwealth avenue, since the extension of the West End lines, have been very generally taken up and built upon by the most desirable class of citizens.

The days of Brookline as a place for Summer residences and country estates are past, and the buildings now being erected are substantial homes, costing anywhere from $10,000 to $20,000, and occupied all the year round.

Another very marked sign of the increased value of property throughout this section is found in the fact that the large estates are being cut up into building lots, and gradually finding their way into the open market. These are bringing exceedingly good prices, and there are still a number of property holders in that section who are holding their undeveloped land at prices ranging from $40,000 to $50,000 per acre.

Notwithstanding the long financial depression, building has been and is remarkably active, and is following the lines of the electric roads as fast as they are pushed forward. The tendency of prices is steadily upward, and many of the long-headed land owners in this beautiful section are holding on to their property in full confidence of still further advances in value. The same thing may be said to a greater or less extent of nearly all the outlying suburbs of Boston, which are coming more and more into favor as places of residence as the means of reaching them improve. What is true in this section is equally true in others, and property owners should help along the development of the electric roads in all sections as the surest means of advancing their own interests.

Wall Street and the Electrical Stock Market.

The market for stocks and bonds during the week under review has been controlled almost exclusively by currency developments. Events have been startling in their nature and have followed one another in quick succession. The exports of gold were $7,278,879 and the movement for the year $26,520,000. The gold reserve has declined to about $42,000,000 and talk of a premium on gold has become rife. So acute became the situation that President Cleveland, in view of the refusal of Congress to take remedial legislation, has been forced to decided upon a bond issue. Before this report reaches the reader the issue will be announced. This will undoubtedly relieve the situation temporarily, and pave the way for action by the Republican Congress. Stocks all advanced on covering by professional speculators of their short contracts. Bonds as a rule reacted on the belief that the new bonds will be sold at a figure lower than issues outstanding, thereby forcing a depreciation in values.

In electrical stocks, General Electric was the feature. There was, undoubtedly, liquidation early in the week by timid holders forced by bear traders, who marked off the price. The sharp drop on Monday from 33⅛ to 29⅝ gave rise to all sorts of ugly rumors, the nature of which is familiar to most electrical interests. The stock rallied later. On Thursday it was again attacked, going to 39 and later recovering. In the latter part of the week there was heavy buying by J. W. Davis & Company, recognized Vanderbilt brokers, probably for the account of Director Twombly. The 5 per cent debenture bonds declined from 90 to 88 and recovered to 89.

The annual report of the company will not be made until the third week in May. Already busybodies are at work prophesying that the showing will be extremely bad. Inasmuch as these utterances have become chronic they no longer carry any weight, except with certain bear traders who are believed to furnish the ideas and the object.

While it is true that the company has lost an important patent suit or two, and must eventually part with its other patents by virtue of expirations, the fact should be borne in mind that if the company cannot contest control of the patents no competitor can. This will render competition open. The management during a year and one-half has been preparing for just such a contingency, and is now in condition to control business, not as heretofore through a monopoly, but by reason of being able to sell competitive goods at competitive prices. This is the secret of its strength. Moreover, this change in policy has cheapened apparatus of all kinds, which in turn is bound to stimulate a demand greater than has ever before been enjoyed just as soon as business becomes normal.

There was some little liquidation in Edison Electric Illuminating of New York, which worked the price down to 95 as against par a week ago. The bonds also weakened fractionally, selling at 108¼ to 107¾. The cause of the selling was foreign to any development which occurred in the affairs of the company.

The New York and New Jersey Telephone Company have called in its last mortgage 6's dated March 2, 1895, due March 2, 1905, on March 2. They will not draw interest after that date. They aggregate $403,800 and draw 6 per cent interest. The company also offers for subscription $375,000 of its 5 per cent gold bonds at 103. These bonds are a part of an issue of $1,500,000 held for the redemption of the first 6's.

On the Boston Exchange Bell Telephone was unchanged at 190½. Erie Telephone weakened 3 points to 46 and later recovered 1. General Electric preferred was weak at 66. New England Telephone was steady; Electric Traction, of Philadelphia, was bid 74 and held for 75¼. Westinghouse preferred weakened 1 point, to 49 to 49½; the common was unchanged at 31½ to 32½.

The Erie Telegraph and Telephone Company declared a quarterly dividend of 1 per cent, payable February 18 to stock of record February 10. Books open February 17. BAIN.

New York, February 2, 1895.

General Electric, Monday, February 4, sold down to 28⅛—lowest price ever recorded. Bear pressure was the cause in conjunction with dull market. BAIN.

THE LATEST NEWS.

The Central Union Telephone Company, a licensee of the American Bell Telephone Company doing business in Illinois, Indiana and Ohio, has cut rates at Decatur, Ill., 50 per cent on account of competition.

An interesting experiment was performed at the plant of the Citizens' Light and Power Company, Rochester, N. Y., on February 2. It consisted in running combined alternating and direct current generators in multiple arc.

Justice Gaynor, of the Supreme Court in Brooklyn, N. Y., has given permission to Charles Dodds, the temporary receiver of the Lewis & Fowler Manufacturing Company, to continue the manufacture of minor appliances for cars. The Lewis & Fowler Company, of which President Daniel E. Lewis, of the Brooklyn Heights Railroad Company, was the former president, recently failed. Francis N. Ross, one of the stockholders, alleges that the officers of the company are directly responsible for the financial muddle in which it has become involved, and he has asked District Attorney Ridgeway to have its affairs overhauled by the Grand Jury. Mr. Ross accuses the officers of the company with having misrepresented the financial condition of the company, and with paying out dividends when the company was really insolvent. Mr. Lewis says that he was as badly deceived as any of the other stockholders, and that he was the heaviest loser himself in the concern.

THE ELECTRIC LIGHT CONVENTION.

ARRANGEMENTS FOR THE SPECIAL TRAIN ARE MADE—9.30 A. M., MONDAY, FEBRUARY 18, THE STARTING TIME — NEW YORK CENTRAL THE ROAD SELECTED—A LARGE ATTENDANCE PROMISED —HAVE YOU RESERVED YOUR SEATS ON THE SPECIAL?

It has finally been decided by Master of Transportation C. O. Baker, Jr., to start the special convention train from New York at 9.30 A. M., Monday, February 18, over the New York Central and Hudson River Railroad. The Special will run as a second section of the Fast Mail instead of following the Empire State Express, and leaving at 8.30 A. M., as was at first proposed. The Special is expected to arrive at Cleveland before midnight on Monday.

Orders for parlor car seats are coming in rapidly and those who intend to go to Cleveland on the Special and have not yet reserved accommodations would better do so at once.

It is understood that the General Electric Company will assist in entertaining the Boston delegates between their arrival at Albany about 8 o'clock and the arrival of the Special from New York. It is expected that breakfast will be served at the Edison Hotel at Schenectady, and that a trip through the General Electric Company's works will be made.

A number of delegates will go to Cleveland over the Pennsylvania Railroad from Philadelphia, Washington, Harrisburgh and Pittsburgh.

Secretary Porter has made his final arrangements at Cleveland and the local entertainment committee is anxiously awaiting the advent of the delegates who will put their hospitality to the test.

The following additions have been made to the programme:

"A New Method of Measuring Illumination," by Professors E. J. Houston and A. E. Kennelly.

Topic: "Underwriters' Rules *vs.* National Electric Light Association Rules."

Topic: "Practical Demonstration of Protecting Lines From Lightning," by A. J. Wurts.

The entire programme for the Cleveland meeting is now completed, but it must be approved by the president before its publication.

The following official announcement of the arrangements for the special train from New York has been received:

TO THE EDITOR OF ELECTRICAL REVIEW:

Arrangements have been completed with the New York Central and Hudson River Railroad Company for a special train of Wagner vestibule, parlor, dining room and buffet cars, leaving Grand Central depot, Forty-second street, New York, at 9.30 A. M., Monday, February 18, running as second section of the Fast Mail on the following schedule:

Leaving New York,	9.30 A. M.	
" Albany,	1 P. M.	
" Utica,	3.17 P. M.	
" Syracuse,	4.40 P. M.	
" Rochester,	6.30 P. M.	
" Buffalo,	7.25 P. M.	Central Time
" Erie,	9.33 P. M.	"
Arriving at Cleveland,	11.55 P. M.	"

Seats can now be secured on this train by applying in person or by letter to the office of the National Electric Light Association.

A special rate has been granted (on certificate plan) of a fare and one-third from all points in the United States east of the Mississippi River, Peoria and Chicago, Ill., to Cleveland. To obtain this rate it is necessary in purchasing going ticket to ask the ticket agent for a certificate, which, when properly *viséd* and endorsed at Cleveland, will entitle the purchaser to a one third fare returning.

That the best results may be obtained, it is very desirable that delegates should make their application for space on the New York Special at the earliest possible moment.

The following gentlemen have charge of transportation in their respective districts, to whom application can be made for all information:

A. C. Shaw, 620 Atlantic avenue, Boston, Mass.; H. A. Cleverly, 1018 Chestnut street, Philadelphia, Pa.; E. H. Heinrichs, Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa.; E. L. Powers, Monadnock Building, Chicago, Ill.

C. O. BAKER, JR.,
Master of Transportation.

New York, February 1, 1895.

Rapid Transit Matters in New York City.

The board of experts appointed to consider Chief Engineer Parsons' rapid transit plans have advised that the construction of an underground road be deferred and that the present elevated roads be extended and improved for the present requirements of travel. The experts reported in favor of a plan advocated some time ago by Mr. A. A. McLeod, which is:

The double decking of the Third and Sixth avenue lines, with six express stations supplementing the 26 lower local stations, all trains on both decks to be operated by electric power from a central station, thus dispensing with the dirt and dead weight of the engines.

New stations with passenger elevators at the express depots are proposed. The present structure can be strengthened to carry the upper deck, and new work can be done without interfering with present traffic. This would bring 129th street to within 18 minutes of City Hall and 155th street to within 20 minutes of South ferry.

According to Mr. McLeod's plans approximate estimate of cost of structure is $10,000,000; total electric equipment, $3,552,500; 15 double deck stations, $375,000; real estate, $1,072,500; total, $15,000,000. To this is added cost of structures north of the Harlem, making a total of $20,000,000.

SOME CHARACTERISTICS AND ECONOMIES OF ACCUMULATORS AS APPLIED TO CENTRAL LIGHTING AND POWER STATIONS.

READ BEFORE THE NORTHWESTERN ELECTRICAL ASSOCIATION, MILWAUKEE, JANUARY 16, 1895, BY JOHN R. MARKLE.

As the title of this page is meant to suggest, it is not intended to treat upon the chemistry of or mechanical construction of accumulators. Beginning with the simple statement of fact that the commercial storage battery of to-day has been the most difficult piece of apparatus to perfect known to the art, and the attempt will be to call attention to certain known attainments, and therefrom show the economies and helpfulness that must follow their application to practice.

Due to physical laws, accumulators embody many natural characteristics which eminently fit them for fulfilling three prime functions in electric lighting and power distribution.

They fulfill these three important functions more perfectly and at the same time with greater economy than any other apparatus. These three functions are:

1. Storage or holders of potential.
2. Equalizing or controlling pressures.
3. Transforming or transmitting electro-motive force and current.

Any one, two or all three of these offices are fulfilled by accumulators at one and the same time as may be required.

Under these three heads, let us consider some of their characteristics and accompanying conditions which fit them for application to practice.

I.—STORAGE.

Their most marked characteristics are found in their more economical working at minimum or slow rates of charge and discharge.

Opposite results follow the operation of steam boilers, engines and dynamos under light loads.

It is here at once manifest that by telescoping or manipulating intelligently these two opposites there will be obtained the nearest perfect results:

1. By obtaining a better "time factor" during which to generate and pass current over feeders to sub-distributing points, and thereby enabling reductions in their size and cost.
2. A better "load factor" would at some time be secured for the generating machinery.
3. Greater economy in consumption of current, hereinafter shown under head of "transforming."

The area of space required for accommodation of batteries is less than for steam, air or water "storage," until very high pressures are reached. A space of 10 yards square will accommodate a battery having a capacity of 1,000 kilowatt hours.

Cost of containers or holders of the active or working agent is less with accumulators than with steam, air or water, and depreciation and repairs thereon is less; also their life is greater.

With steam, air and water, "storage" load diagrams show that the pressure or work line falls rapidly, whereas with accumulators and line at and near the two volts per element, remains nearly horizontal for a period of about eight hours.

We may here understand why it is that air and steam are poor agents for "storage" and note the weak features that obtain with water. Steam, air and water are, therefore, good agents for direct supply work, but efforts to "store" them direct have met with but indifferent success. This is due to so many adverse conditions, and are sufficiently familiar to all to preclude necessity of referring to them here.

II.—EQUALIZING OR CONTROLLING PRESSURES.

Accumulators perform this, which is one of the most important requirements in the distribution of electrical currents in manner most perfect. For steadiness and constancy no source of electricity or power can compare with a storage battery. Each element and series of elements making up a battery begins and ends with a negative terminal and thus differs in marked characteristics from all other forms of apparatus.

An element or series of elements will transfer any excess of current (amperes) contained to others of lower electro-motive force and thus automatically equalize the total electro-motive force.

"Short circuits" and "grounds" are promptly "blown" by accumulation from their quickly responding store of accumulated energy. In fulfilling this function they maintain the electro-motive force on the distribution line and so prevent excessive rushes of current from generators to motors and lamps, causing excessive sparking and cutting at commutators or other contacts and ultimate burning out of armatures of generators and motors and destruction of lamps. Absence of close equalizing of pressure precludes the employment of high economy lamps, due to frequent high pressure strains on the lamp filaments.

In continuous current distribution no form of dead equalizers, or what are known as machine or "live" equalizers have enabled the use of incandescent lamps of better efficiency and three and one-tenth watts per candle.

Alternating current transformer equalizing so generally in use does not make as good showing, in that three and six-tenths to four watts per candle is the requirement in this practice everywhere.

With accumulator equalizing, lamps consuming but two and one-half watts per candle can be employed, showing an economy in use of current over dead equalizers of about 20 per cent, and over dead metal transformers equalizing in general use from 35 to 45 per cent.

III. — TRANSFORMING OR TRANSLATING ELECTRO-MOTIVE FORCE AND CURRENT.

It is pre-eminently the best practice to charge accumulators in series and discharge them in multiple, and thus under conditions of their best handling it is found they fulfill the functions of ideal "transformers."

At the same time they will also operate as equalizers and fulfill "storage" functions on but one drop or less of 10 to 25 per cent, owing to conditions under which operated.

All other forms of transformers and equalizers pass current irregularities and armature impulses unrectified through to the secondary lines and into the lamps, thereby subjecting them to further damaging strains and shortens or destroys their life. Therefore, a tougher and less efficient lamp is required as a first condition to commercial lamp life.

Accumulators do not thus pass to the secondary lines and lamps such primary irregularities and impulses.

Attention is here specifically called to this valuable characteristic, viz.: That it matters not how irregular the current may flow into a battery or how many and marked its impulses, the discharge current from the battery will be thoroughly rectified, even and smooth and entirely freed from all defects.

APPLIED TO CENTRAL LIGHTING AND POWER STATIONS.

In order to determine what values a set of accumulators would produce for any given central station, the first cost of the accumulator should be set off against their achievements.

If their achievements show that they wrought changed conditions in working of the machinery and other apparatus to enable better "time" and "load" factors, and thereby increased the net profits, the sum total of such increased profits are due to the accumulators.

It is well-known that the more hours machinery can be operated at full load during the 24 hours of each day, the larger will be the net earnings; also that the most economical point at which any station can be worked is where the sum total of the day's demand is not by the fewest hours working of all the machinery under full load.

Is it not at once manifest that these conditions of working can be secured only by use of accumulators?

The condition of capital invested in machinery is like wages invested in workmen. If a manufacturer paid men, say, $3 each day, and who labor but two hours each day, they would produce poor results for the investor. If they labor 10 hours, better results follow. Could they all labor 24 hours per day at about the same cost, as can an engine and dynamo, much better results still would follow. We would then have the best possible results.

Now, let us imagine all of the men working for a few minutes, then some of them begin to "soldier" and do three-quarters, one-half, one-quarter work, finally "lay down" and quit, and after a few hours have elapsed all have ceased labor until the next day. This represents poor load and "time" factors.

Let us look again and we see this manufacturer producing bricks. His unsteady and "spurty" workmen load them into wagons which start for market. The wagon boxes have holes and are without tailboards, and when they reach the buyer one-half of the bricks have leaked out on the road. This represents bad "distribution" or losses from intermediates, which tax and thus leak away the produce while on the wires to market.

We look again and we see the brick buyer cheating our poor manufacturer in the court. This is awful. However, it fairly shows results from use of three six-tenths and four watt lamps.

Where lamps of four watts per candle are employed, as against three one-tenth watt lamp, a saving in current is shown at the lamp alone, of about 20 per cent. Many stations show an aggregation of other losses between the generators and lamps, ranging from 30 to 50 per cent.

If the latest and most efficient style of lamp is used, which battery regulation alone can enable at this time—namely, two-and-a-half watts per candle—so large measure of saving appears as now to call serious attention to the ablest engineers to the problem of adapting all classes of current for battery use.

Mr. Wysslong, electrical engineer to the municipality of Zurich, Switzerland, in his report for the year 1893, on the working of the largest existent example of distribution by alternating currents and "banked" transformers, states in closing his report, that "Losses in distribution are 20 per cent in the transformers, 17 per cent in the network of distribution, 20 per cent in the one alternating generators and seven per cent in the excitation of the generators; total, 64 per cent; and suggests for remedial arrangement that accumulators be introduced as soon as motors suitable for transforming alternating into continuous currents, or other devices for commutating alternating into direct currents, shall be available."

When recently in Portland, Oregon, where a lamp undertaking is being inaugurated for generating and transmitting of three-phase currents, I found that commutating machines were to be employed for transforming the three-phase into continuous currents for lighting and for stationary and street railway power uses.

In this case why not have employed continuous currents from first to last.

The voltage employed is but 6,000. The distance of but 14 miles.

From statistics published in Switzerland for the year 1893, we find that there were 24 transmission of power installations; 16 used continuous currents; six three-phase; one two-phase and one one-phase currents. There was an increase of 37 per cent in the number of new accumulator stations which numbered 40.

German statistics show that by far the greatest economy in fuel consumption and net earnings are shown by accumulating stations. At Altoona, with a station of but 468 kilowatt hours capacity per day, the fuel cost is but five and three-tenth pounds per kilowatt hour of current delivered. One firm alone, Hagon & Company, of Germany, had installed prior to 1894, one hundred central stations and 3,000 isolated storage battery plants.

The drop or loss from a battery is often estimated singly, whereas it should be computed on the total electrical energy generated by the station, and the total values thus fairly arrived at.

Average practice shows that where batteries are working at an efficiency of 75 per cent, the ratio of battery loss to total net output is from 10 to 14 per cent, and at 85 per cent battery efficiency, six to nine per cent. Average accumulator costs for depreciation and repair show them to be about the same as on the steam plant.

In central station work it has long been demonstrated that one of the most helpful economies lies in the lamp. It was observed as early as the year 1888 that stations using four-watt lamps, and whose earnings were three to five per cent, and on changing to three and one-tenth lamps without other alternations or additions whatever, the net earnings were immediately increased to from 15 to 20 per cent. Since that time all observing and successful central station managers have endeavored to secure conditions enabling the use of higher economy lamps, first, last and all the time.

It is hardly necessary to contrast the hardships of a business paying 50 to 70 per cent extra for cost of producing and distributing or marketing its product with one that is not so environed.

The first cost of producing and installing accumulators is generally misjudged, for the following reasons:

1. Lack of knowledge of the many details of manufacture of a properly constructed element and the necessary supplemental apparatus required for their working, such as instruments and their assembling, containers, racks, insulators, electrolyte, labor, freight and supervision.
2. Interest or increment on capital invested in factories and machinery and advanced for raw material.
3. Working capital and necessary to bridge between time of sales and dates of collections.

4. Costs of selling the product, such as solicitors' and agents' salaries.

5. Books, stationery, advertising, etc.

6. Losses from bad debts.

7. Insurance and taxes.

8. Costs of administration over all those.

The railway power house offers at once the most favorable opportunities for accumulators. Here are found the most frequent and widest ranges of fluctuation of load and the largest accumulative damages to fall upon expensive equipment. It is, therefore, highly essential to have the most helpful equalizing, economizing and reliable apparatus possible. It is instuctive to note that about the first electric railway power house battery was installed at Zurich, Switzerland, where coal is high and local conditions such that usual average costs of operation of electric roads would preclude possibility of showing prospective profits.

The makers of an accumulator of established reliability, guaranteed the costs of maintenance whereby their costs become known quantity and the road was constructed and put into successful operation. Results last obtained in June, 1894, showed a saving of two and two-tenths pounds coal per horse-power per hour, amounting to 2,500 per year. The cost of the accumulators are earned in about four years from the saving of the coal alone. This saving is due to the facts that the engines are running continually at their best efficiency, and that repairs are much less, owing to the absence of load variation, shocks and burning out of generator and motor armatures.

A combined accumulator, steam and dynamo plant for railway power or other central station work is often regarded as a very expensive style of equipment.

This is erroneous. An original plant of this description should cost but little (if any) more than a direct supply plant of good design. Illustration:

500 HORSE-POWER DIRECT SYSTEM.

Cost of steam plant $70 per horse-power	$35,000
Electric plant 400 kilowatt at $30 per kilowatt	12,000
	$47,000

500 HORSE-POWER STORAGE SYSTEM.

One-half above steam plant	$17,500
One-half electric plant (200 kilowatt)	6,000
750 kilowatt hours accumulator capacity at $30 per kilowatt hour.	22,500
	$46,000

What is of most vital import to the central stations are the "load" and "time" factors, for on these depend the commercial weal or woe of business. With them rests the size of the dividend. They are the arbiters of success or failure.

The maximum and ideal "load factors" has not been obtained until all the machines in a station are running continuously at full load.

Conversely: The maximum and ideal "time factors" has not been secured until the feeders of the system of distribution are passing continuously, the same and the least number of watts that will fill the total demand.

The system that fulfills these requirements best must of necessity embody "storage" in some form, and without which it is at once manifest no system is "further in the race."

I venture the opinion that when the glamor and mystery enshrouding the present plethora of electrical hieroglyphics and pyrotechnics shall have died out, it will be found with our industry as with its predecessors, that in their first discoveries and simple expressions is embodied all there is of commercial worth, no matter how many beautifully fascinating old complex combinations are sprung or how high the angels flew.

Another Electrocution at Sing Sing.

David Hampton, a murderer, was electrocuted in the prison at Sing Sing, N. Y., on January 28. Among the witnesses was Prof. A. E. Kennelly, of Philadelphia. Electrician Davis had charge of the affair and had prepared a code of bell signals for use between the death chamber and the dynamo room. These were as follows: Five bells, get ready; one bell, turn on current; two bells, more; three bells, less; one bell, shut off; six bells, all over.

A sponge cap saturated with salt water was attached to Hampton's head and another sponge was fastened on his right ankle. The signal was given at 11.15.13 A. M., the current was shut off at 11.16.10 and at 11.20 a coroner pronounced the man dead. The only mark of the shock is reported to have been a slight distension of the neck and a faintly green hue of the skin. After the autopsy the coroner said that death had been instantaneous and painless. It was found that most of the blood vessels of the brain were burst and the vocal chords were not contracted.

A current of 1,740 volts and eight amperes was used. The current was lessened for four seconds, then increased to the first force and then gradually lessened to 150 volts and one and one-half amperes. The time during which the current passed through the body was 57 seconds. Hampton was a good-looking, light-colored negro, slightly undersized, but strongly built and about 27 years old.

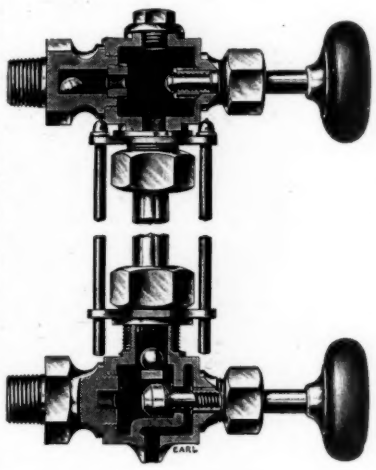
The American Street Car Horse in Great Britain.

A representative of a contemporary paid us a visit the other day in great anxiety as to the ultimate fate of horses now that electric traction is coming more prominently to the front, says the London *Electrical Engineer*. He assured us that during the past five months no less than 5,000 horses which had previously been engaged in tramway working in the United States had been landed at a Scotch port, and that although they were not sent to England, as American cattle sometimes is, as "prime Scotch beef," yet they had a depressing effect upon the prices of horses in this country. We of course expressed sympathy with our friend, who, continuing, asked whether it was possible that electric traction would develop in England proportionately to the same extent as in the United States, and whether electric cars would supersede 'buses, carts and brewers' wagons. As we are not among the prophets, we had to refrain from predicting the future.

Holyoke people will petition the Massachusetts Railroad Commissioners for the construction of an electric line between Springfield and Northampton.

A New Automatic Water Gauge.

We illustrate herewith an automatic water gauge containing several new features. As will be seen from the illustration, this water gauge closes automatically by means of the two ball valves which fly at once to their seats upon breaking of gauge glass, effectually closing the gauge against both water and steam. One of the new features is turning the handle of the upper valve as far to the left as possible, bringing the valve stem out of line with the glass, then removing cap from top of gauge, glass is dropped through, nuts and washers put on and glass drops to its seat in the lower part of the gauge. The gauge is again put into service by first closing both valves to their seats against the boiler, as shown by dotted lines in the cut, then opening the lower valve about a half turn, when water will show in the glass, after which the upper valve is opened slowly, then the lower valve is opened full until it seats against the drain cock chamber. It will be seen that the lower valve is double-faced, seating both against the boiler pressure, and also against the drain cock chamber to the right. This



A NEW AUTOMATIC WATER GAUGE.

brings out the second new feature in this water gauge, which is that no pet cock is used, but the gauge is drained by a half turn of the lower valve handle to the right, opening the drain chamber passageway, and this also allows the lower valve to be used as a try cock if the glass breaks and no new glass is at hand. Engineers, who suffer frequently from burned fingers when draining old-fashioned water gauges by the pet cock on the bottom, will appreciate this improvement.

Another new feature is that the valves can be reground to their seats. This is accomplished by having the valve stem run in a gland which is tightened by the packing nut of the stem. Valves are reground by releasing these packing nuts about three turns, which allows the gland to slide in the body of the gauge. The valve can then be closed against either seat and reground by simply turning handle back and forth a few times. As will be seen by examination both upper and lower shanks are screwed into the body of the gauge. This permits the bodies to be taken off and cleaned without disconnecting the gauge from the boiler. This water gauge is manufactured by the Penberthy Injector Company, of Detroit, Mich., having been recently patented by them, and, although only a short time on the market, is meeting with a very rapid sale.

Electric Transmission at Pelzer, S. C.

The Pelzer Manufacturing Company, of Pelzer, S. C., has contracted with the General Electric Company for a three-phase electric transmission plant that will be exceptionally large and interesting. At the generating station, three miles from the cotton mills owned by the company, there will be three slow speed generators of 750 kilowatts each directly coupled to water wheels. These dynamos will generate current at a potential of 3,300 volts, and the current will be fed directly to the transmission wires at this pressure. The transmission line will consist of 18 No. 00 wires, this size having been selected in preference to larger wire to reduce the line induction as much as possible under the existing conditions. At one mill will be located a 400 horse-power synchronous motor, receiving current directly from the wires. There will be, in addition, more than 20 induction motors in various rooms. Of these, 14 will be 110 horse-power motors, and the others will be of various sizes, from five to 75 horse-power. In a sub-station will be located nine 160 kilowatt transformers for the motors and for 1,200 incandescent lights for the mills. Two electrically operated blowers of three horse-power each will be used for cooling the transformers.

Berlin Iron Bridge Company Elects Directors.

The annual meeting of the stockholders of the Berlin Iron Bridge Company was held at the office of the company, at East Berlin, Conn., on Tuesday, January 29. The following board of directors was elected: Chas. M. Jarvis, Geo. H. Sage, F. L. Wilcox, and Burr K. Field, of Berlin, Conn.; S. Howard Wilcox, of Brooklyn, N. Y.; Julius Burr, of East Berlin, Conn., and H. Peck, of Waterbury, Conn. By vote of the stockholders, the capital stock of the company was increased from $300,000 to $500,000. The new issue of stock has all been taken by the old stockholders.

Wenstrom Company's Affairs.

In the case of Receiver Randolph Barton, of the Wenstrom Consolidated Dynamo and Motor Company, against the stockholders, which has been on trial for some time in the Circuit Court, at Baltimore, Judge Wright has made a ruling which is construed to hold, in effect, that only the directors may be held liable to the creditors for the difference between what they actually paid for their stock and the par value per share of $100. This unpaid balance is being sued for by the receiver of the company, in order to pay debts aggregating about $40,000.

TELEPHONE NEWS AND COMMENT.

Middleport, N. Y., is to have a telephone exchange.

The Traction Company at Middletown, N. Y., is putting in a telephone system of its own.

The New England Telephone and Telegraph Company is trying the "pilot lamp" system on several of its Boston switchboards.

The Chesapeake and Potomac Telephone Company at Hagerstown, Md., has been connected with the long distance line to New York and Chicago.

Mr. J. C. Caswell, special agent for the New York and Pennsylvania Telephone and Telegraph Company, is in Erie, Pa., to look after the service, extend it and listen to complaints and take measures to correct defects in the system.

A considerable part of the money derived from the sale of the American Bell Telephone Company's stock by auction will be devoted to work in eastern territory. Plans are now being matured for considerable construction work in the West as soon as Spring opens.

H. E. Allen, the present manager of the Central Union Telephone Company's exchange at Akron, O., will soon leave the city to accept a similar position at Dayton, O. He will be succeeded by Mr. Keck, who at present has charge of the Zanesville office of the company.

The Central District and Printing Telegraph Company and the McKeesport Telephone Company are having a rate war, and the patrons are the gainers. The Central company has offered a yearly rate of $25, which is below that of the McKeesport company. The local company will, it is said, meet the cut.

Attorneys for the Western Electric Company are now preparing the papers in infringement suits which will be at once instituted against magneto telephone manufacturers and dealers in New York and vicinity. There are about 30 of these suits in preparation and the ball will be set a-rolling this week.

James Toole, an operator at the Solvay exchange, and Miss Minnie Emerson, an operator at the Syracuse, N. Y., central office, did all their courting by telephone and were married last week. "Oh, yes," said Mr. Toole, when asked if he had seen his wife before he married her, "I went to her house two or three times."

The long-distance telephone line between Madison, Wis., and New York and Washington was opened at 2 o'clock P. M. on January 24, the Governor and State officers attending the ceremony at the Park Hotel. A conversation was carried on between Madison and the eastern cities and there was singing by quartets at both ends of the line.

G. W. Hale & Company, representing the Phœnix Telephone Company, have secured a franchise from the City Council for the construction of another telephone exchange at Upper Sandusky, Ohio. First-class service is guaranteed and the rates stipulated as $2 per month for business places and $1 per month for residences. The exchange is expected to be in operation before May 1.

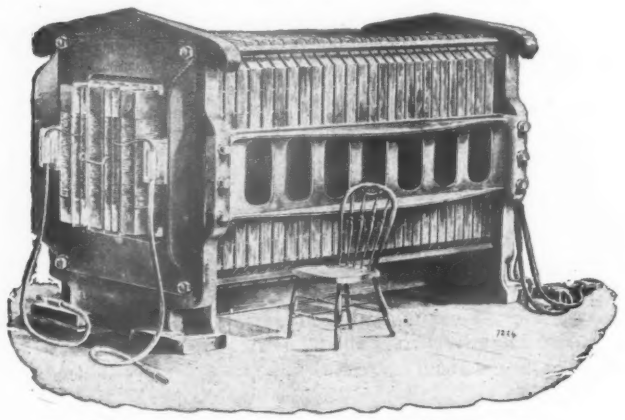
An effort is being made to organize a local telephone exchange at Rock Rapids, Ia., to furnish means of communication between various parts of the county and through connection with the system of Sioux County with Sioux City. It is proposed to run a line from Doon to Rock Valley to connect with the Sioux County exchange, and through it to get in hail with Sioux City.

Mr. Herbert Laws Webb, of the engineering staff of the Metropolitan Telephone and Telegraph Company, New York, has returned from an extended European trip made in the interests of the company. It is understood that Mr. Webb's object was to familiarize himself with the latest European telephonic practice, and that he was generally afforded facilities for acquiring this knowledge.

Telephone companies, backed by local capitalists, have recently been organized in Connellsville, Uniontown, Scottdale and Mt. Pleasant, Pa. In these places some dissatisfaction has existed with the rates made by the Central District and Printing Telegraph Company, which charged $60 a year for instruments. The long distance rate from Connellsville to Pittsburgh, 58 miles, is 30 cents. The new companies propose to use the Harrison system.

The Citizens' Telephone and Message Company, a new organization, announces that it will have its system at Tiffin, Ohio, in running order about April 15. They have 265 contracts with Tiffin people for their 'phones, and the plant will be connected with the line at Fostoria, and it is probable that Bucyrus and Mansfield will be connected with Tiffin and Fostoria. The officers of the company are H. H. Noble, president; Charles E. Derr, secretary; W. S. Wagner, vice-president and general manager, and H. J. Weller, treasurer.

Mr. Clarence G. Mead, of the Telephone Equipment and Construction Company, South Norwalk, Conn., installed, about six months ago, a telephone exchange system at Ridgefield, Conn., using battery instruments. Mr. Mead reports that the Southern New England Telephone and Telegraph Company closed up their Ridgefield exchange about September last on account of the success of the opposition company. This exchange is well equipped mechanically, and all the circuits are metallic. Connections have already been made with other new exchanges in Danbury, 10 miles distant, Norwalk, 17 miles south of Ridgefield, Georgetown and Branchville. Mr. Mead is an excellent organizer and is interested in several electrical enterprises in New York and Connecticut. He equipped the penitentiary at Wethersfield, Conn., with a fine private service a few months ago, and he is now estimating on several propositions for other public institutions.



GENERAL ELECTRIC COMPANY'S LARGE TRANSFORMER.

General Manager Nicholson, speaking of the new exchange to be put in at Syracuse, N. Y., says:

"We hope that the system now being experimented with in New York city, and known as the common battery system, will have been perfected so that we may put it in operation in this city. This new system, which will doubtless prove successful, does away with the battery at the subscriber's residence or office. For instance, the 1,500 subscribers in Syracuse who have batteries connected with their telephones at their residences or places of business would be served by a storage battery at the central office, consisting of 30 or 35 cells. The outfit at the subscriber's end of the line consists simply of a small signal bell, together with the telephone and transmitter. No calling for the central office or ringing off is required. The act of taking the telephone from the hook in the new system calls the central office and the hanging up of the telephone clears out the line, and with the usual signals at the central office the operator can tell at once when the subscriber leaves his telephone. The new system is sure to come. It will be adopted here as soon as it is perfected."

General Electric Company's Large Transformer.

The development of transformers of very large capacity for sub-station and large power transmissions has been the subject of much careful study and research on the part of the General Electric Company, and those difficulties which for some time were considered almost prohibitive of the use of very large transformer units have been most successfully overcome.

The principal difficulty met with in transformer work is the matter of temperature. All large transformers, to be efficient and economical, must be provided with artificial means of cooling.

Many methods have been from time to time proposed for the artificial cooling of large transformers; such, for example, as the circulation of oil through the transformer and a cooling tank, or the passage of water or other cooling fluid through pipes within the transformer.

Such methods have shown themselves to be complicated and inconvenient. The General Electric Company has, however, devised a simple and efficient air blast system, which consists of a transformer having numerous air ducts through which cool air is constantly forced by means of a blower, the temperature being sufficiently reduced by radiation from the walls of the ducts. This system is practically the same as that by which all large dynamos are kept cool, differing only in that we are so fortunate as to have in the dynamo a rotating armature to create the necessary draft, while in the transformer a separate fan has to be used.

By means of the air blast the rise in temperature may be readily kept below 60 degrees C., or even lower if required, the 200 kilowatt transformers recently manufactured for the Cataract Construction Company having a maximum rise of but 35 degrees C.

The power required to supply the necessary air blast, of course, varies with the transformer capacity installed, and also with the distance that it is necessary to convey the air from the blower to the transformer. Under ordinary conditions, however, it will not exceed one-half of one per cent of the total capacity of the transformer cooled, and in large sub-stations it may generally be reduced to one-fourth of one per cent.

A simple method of installing one or more large sub-station transformers is to place them over a duct beneath the floor, having suitable openings beneath each transformer for the air blast, which is maintained in the duct by means of a blower driven from any convenient source of power, the duct at the same time serving as a convenient place to locate all wires coming to the transformers. The air passes through the duct upwards through the transformer, and may either escape into the surrounding room or may be led away through other ducts as may be found most convenient.

Transformers of the air blast type are built in the following standard sizes: 40, 65, 75, 100, 150 kilowatts. Special transformers of intermediate or larger sizes can, however, be furnished almost as promptly as standard apparatus.

English as She Is Spoken by a German Contemporary.

Among our European exchanges, we are honored with copies of the *Helios*, a publication issued at Leipzig in the interest of German electrical manufacturers. This "sunny son" of the North of Germany is a formidable polyglot with three parallel columns, printed in German, French, and English, respectively.

Below we give the readers of the ELECTRICAL REVIEW a choice cutting taken from the December issue, 1894. It is entitled "A Corporation for the Acquisition and Sale of Long Distance Telephone Patents," and reads as follows:

"In No. 2 of our paper we made a communication in which we designed the purpose of the new society, and to day we learn that the Director Mr. Rodewaldt is staying now in Pesth and Vienna for some time, in order to establish, with the consent of the administration of Austria and Hungary, a trial line for telegraph and telephone on the same system of poles (according to Pat. *vs.* Müller). If the trial lines work in a satisfactory manner, which is not doubtful at all after the experiments made as yet, the administrations of Austria and Hungary, as to the informations of the „Berl. B. Cr.", will cover the whole monarchy with an interurban telephone system by means of the existing telegraph lines.

The experiments with the new telephone apparatus „Patent Grabosch" which is said to surpass widely all the apparatuses which are known as yet, as to simplicity, productiveness and cheapness, will also begin shortly on the part of the administration. If the results are favourable this apparatus will be introduced generally in Austria-Hungary for urban as well as interurban service."

The ELECTRICAL REVIEW has not yet seen the "design" of the purpose of the new society, but feels that it is a real *chef d'oeuvre*. How Mr. Rodenwaldt, the director, can stay simultaneously in Pesth and Vienna, we do not quite make out. Doubtless that German is a second Mephistopheles who has the gift of being simultaneously at any number of places; indeed, he must be a wizard, or else how shall we account for this novelty of his, *i. e.*, a trial line on the same system of poles according to Patent Müller. Perhaps this is a misprint, and the real name of Mr. Müller is "Patrick."

"After the experiment made as yet" is a startling use of the Queen's English, but it sounds quite pathetically. "Microphone Grabosch" ought to be a stunner, for fame has it that "it surpasses widely all the apparatuses which are known as yet as to productiveness." We silently wonder what kind of productiveness we may expect from Grabosch.

Meanwhile we congratulate *Helios* on this interesting bit of news, and shall be happy to peruse its next issue.

The New England Telephone and Telegraph Company has petitioned for a permanent injunction against the Brattleboro, Vt., Gas Light Company, controlling the electric light plant in Brattleboro, to restrain it from so using its wires as to interfere with the operations of the telephone plant. The telephone service has been worthless at night because of induction.

THE BROOKLYN STRIKE.

ALL THE LINES OPERATED WITH NON-UNION MEN.

All the lines affected by the great strike of 6,000 employés of the street railway companies in Brooklyn, N.Y., are now running on schedule time with new men. The strike has not been "declared off" in the language of the day, but it has utterly failed. There are still some depredations along the lines of the companies, stoning cars and cutting wires, but if the police are at all vigilant this will soon end. The militia has all been withdrawn.

From the first there has been much complaint of the inefficiency, or more particularly of the indifference of the police. The new police commissioner of that city has evidently much to do before his force becomes one of metropolitan efficiency and loyalty to duty.

President Norton, of the Atlantic Avenue line has notified Police Commissioner Welles that he desired to arm his employés, as the police would not properly protect them. Mayor Schieren vetoed the aldermanic acts calling for licensing of motormen and requiring them to be Brooklyn residents.

Suits are being brought by the attorneys of the strikers to annul the charters of the Atlantic Avenue and Brooklyn Heights companies, claiming failure to observe the 10 hour law.

A Government Contract for the Western Telephone Construction Company.

The contract for the construction of a telephone system for the Interior Department at Washington, D. C., has been awarded to the Western Telephone Construction Company, of Chicago, for $5,565.76. This was the highest bid received. The lowest bid was that of the Gerson Electrical Company, of Philadelphia, Pa., $2,996, whose instruments made an average of 97½ per cent in the test, but the samples submitted, it was thought, looked to be "glaring infringements" on patents of other companies. The Viaduct Manufacturing Company was the next lowest bidder, but their average of 69½ per cent was so low that the committee recommended that it be rejected. The instruments, Colvin system, furnished by Royce & Marean, of Washington, D. C., were open to the same criticism, their average being 84 per cent. The Gilliland Telephone Company, of Chicago, bid $4,694.67, and their instruments made an average of 89 per cent, but as some of the switchboards to be furnished would require two operators, it was decided to accept the bid of the Western company, their average being 95 per cent, and their instruments giving very good results.

The Capo-Farad Battery.

The battery shown full size in the accompanying illustration is probably the smallest, lightest and most compact practicable battery made, while it yields a large current (2 amperes), at a reasonably high voltage (1.1 volts). It will thus be seen that while this battery is at one extreme in point of size, it is at the other extreme as regards the work it can do. It is capable of ringing a door bell for 28 hours continuously, equal to about one and a half years in ordinary use. It will work a faradic motor from 52 to 100 continuous hours, and two cells on a sparking coil in a gas light will give nearly 360,000 ignitions. For testing and blasting it is found to be very efficient and convenient.

CAPO-FARAD BATTERY (FULL SIZE).

The battery consists of a zinc cell eleven-sixteenth inch in diameter and two and three-quarter inches long, closed with a hard rubber stopper, and containing an electrode formed of fused silver chloride. The chloride is cast upon a zig-zag silver wire, the straight end of which extends through a stuffing box in the cover, forming one pole of the battery. The zinc cylinder forms the other pole. The cylinder of fused chloride of silver is inclosed in a covering of textile material, and held in place by hard rubber disks at opposite ends. The disk adjoining the hard rubber stopper is held in place by a short piece of elastic tubing surrounding the silver wire. The space between the silver chloride and the zinc is filled with fibrous material which is saturated with the electrolytic liquid with which the cell is filled.

For many purposes where this battery is to be carried in the pocket, it is inclosed in a casing containing two, four, eight or more cells. A four-cell battery with casing weighs but five ounces.

These batteries are used in the Treasury Department and in other places in connection with small electric lamps for temporarily illuminating vaults, safes, etc. A single cell of this battery is so light that it may be mailed for two cents. It will work in any position, does not polarize, is not affected by climate, and the strength remains constant up to the moment of its final exhaustion.

Mr. James J. Pearson, manager of the Nassau Electrical Company, of 108 Liberty street, New York, after a long series of experiments, has brought the capo-farad battery to its present state of perfection.

Phœnix Glass Company's Factory Burned.

The main factory of the Phœnix Glass Company, at Monaca, Beaver County, Pa., was burned on February 3. The loss is estimated at $150,000, fully insured. The company's warehouse was saved and a new factory has been leased and is already being equipped for work. A fire-proof factory building will at once be erected on the site of the one just burned.

Mr. A. H. Patterson, New York manager of the company, said: "Tell your readers to send their orders right along, as usual. We'll fill them from our warehouse stock which was not hurt by the fire. Our business will not be interrupted by this fire."

The city authorities at Cincinnati have been asked for a franchise by the Tri-State Telephone and Telegraph Company, but we haven't heard of Captain George N. Stone losing any sleep over it.

TELEPHONE RATES.

The improved New York City Exchange Telephone Service, metallic Circuit Lines, long distance equipment, is now offered by us at rates which bring it within reach of even the most moderate users. The prices per year are as follows:

Combination Line, $80.00
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KINDRED INTERESTS

The Joseph Dixon Crucible Company, Jersey City. N. J., is sending out an appropriate calendar for February.

The Electric Heat-Alarm Company, 145 High street, Boston, report that business is improving with them. They equipped three large factories with their automatic fire alarm system during December.

The Middletown and Goshen Traction Company, at Middletown, N. Y., have placed a contract for the new car barn with the Berlin Iron Bridge Company, of East Berlin, Conn. The same parties have a contract for the iron roof over the new oxide shed for the Brookline Gas Light Company, at Allston, Mass.

The Metropolitan Electric Company, Chicago, has just taken the agency for the American Carbon Company's products, and will carry a full line of this celebrated carbon. They will have their stock in a very few days and will be able to meet the demands of the market. This adds another high-class specialty to the Metropolitan company's list.

The Penberthy Injector Company, Detroit, Mich., have issued a new catalogue of unusual value to engineers. Besides other interesting matter, it contains descriptions, illustrations and prices of a number of new water gauges and oil cups which this company is just placing on the market. A copy of this catalogue will be sent, postage free, to any engineer mentioning the ELECTRICAL REVIEW when he writes.

W. T. M. Mottram, formerly with the General Electric Company and other electrical manufacturing companies, has established himself as an electrical engineer at Dallas, Texas. Mr. Mottram is also State agent for the Interior Conduit and Insulation Company, the Helios Electric Company and the Electric Storage Battery Company. Mr. Mottram reports that, although he has been established but five or six weeks, business has been very good and the outlook is excellent.

The Abendroth & Root Manufacturing Company, 28 Cliff street, New York city, sole makers of the Root improved water tube boiler and Root's spiral riveted pipe, find business good, and state that the outlook for the ensuing year is "A No. 1." There has been a lively demand for their boiler from the South and West, for service in electric lighting and electric street railway plants. This is a class of work for which the Root boiler is especially well adapted, and for which it has become deservedly popular.

The Standard Underground Cable Company, of Pittsburgh, reports that its prospects for the year 1895 are very good. The unfilled orders carried over from last year amounted to $58,000, in addition to which the third annual contract with the Philadelphia Traction Company for lead covered underground feeders has just been secured, besides an annual contract with an electric light and power company for electric light cables, which two contracts give promise of at least $250,000 worth of business during the year. The Philadelphia Traction Company has bought from the Standard Underground Cable Company about $700,000 worth of feeder cables (mostly underground, but also some overhead), in the last three years, and owing to special patented devices furnished by the Cable company, the Traction company has an extremely satisfactory and flexible system.

GENERAL NOTES.

A. T. Hay died at Burlington, Ia., on January 22, aged 69 years. He was a skilled chemist, a lawyer of ability, a fine metallurgist, an expert telegrapher, a machinist, an electrician, a student of politics and a historian. He was the inventor of the celebrated Hay steel.

The Berlin Iron Bridge Company, of East Berlin, Conn., have closed their purchasing agent's office in Philadelphia, and hereafter all purchases will be made from the office of the company at East Berlin, Conn. Mr. W. E. Stearns, who lately occupied the position of purchasing agent, has severed his connection with the company and accepted an important position with the Pennsylvania Steel Company.

The Orient and New York Telephone Company is now building a line between Riverhead and Orient, L. I. It will extend from Orient to Riverhead, to Wading River, to Oyster Bay, and then on to New York, taking in all villages on its route. The president is James A. Gildersleeve, of Mattituck; secretary, John A. Bagshaw, of Riverhead; treasurer, O. B. Goldsmith, of Cutchogue.

NOTICE TO CABLE MANUFACTURERS
—AND—
ELECTRICAL CONTRACTORS.

Sealed proposals will be received by the Construction Committee of the Underground System of the Police and Fire Alarm Telegraph and Police Patrol until 12 o'clock noon, Friday, March 1, 1895, for the complete electrical equipment of the electrical subways of the Police and Fire Alarm Telegraph System of Baltimore City.

The equipment to include 130,000 feet, more or less, of bunched cables, from two to 80 conductors, drawing in, splicing and connecting the same, pole terminal boxes, house terminal boxes, cable terminals, test boards, lightning arresters, etc.

Copies of the agreement and specifications, under which the work is to be performed, can be obtained at the office of the engineer by depositing $5, which will be returned when proposals are received.

Proposals should be addressed to the committee, and shall contain a certified check for $500, made payable to the Mayor and City Council of Baltimore.

Right is reserved to reject any and all bids.

CONSTRUCTION COMMITTEE OF THE UNDERGROUND SYSTEM OF THE POLICE AND FIRE ALARM TELEGRAPH AND POLICE PATROL OF BALTIMORE CITY.
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